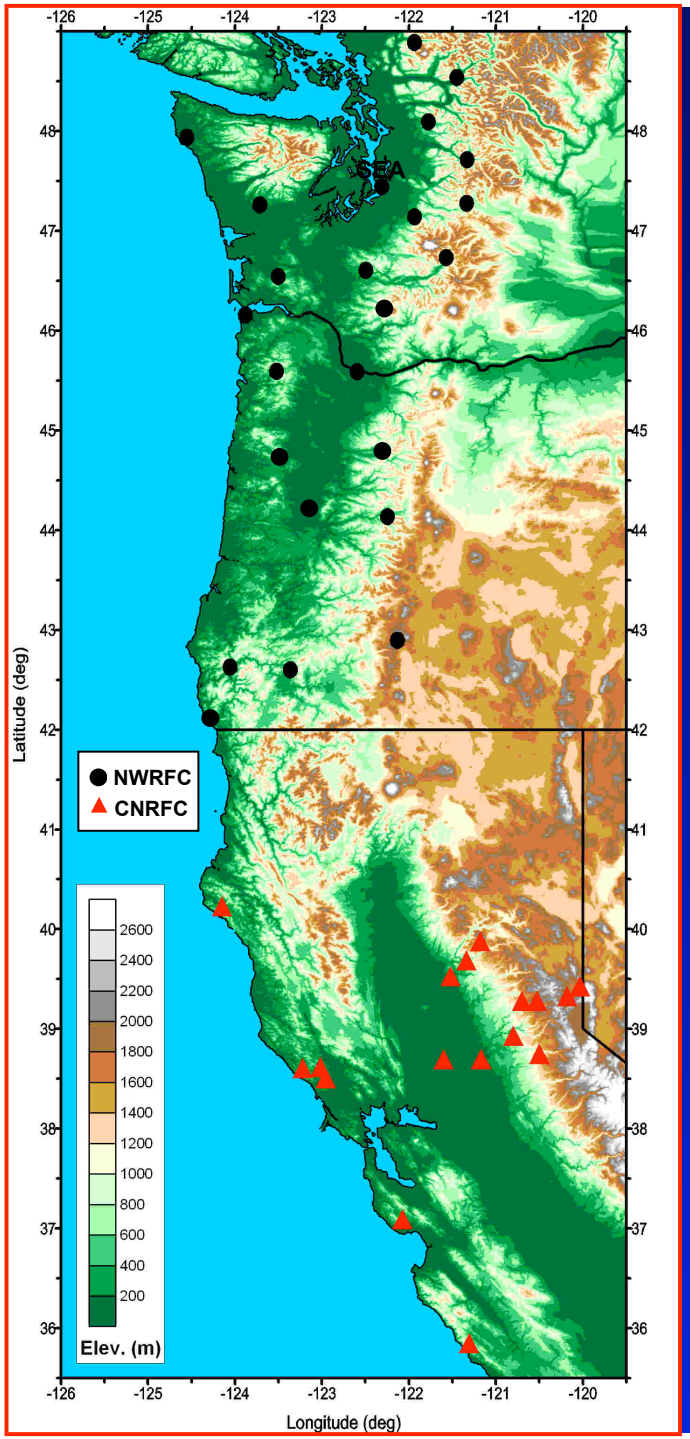

Assessment of Extreme Quantitative Precipitation Forecasts (QPFs) and Development of Regional Extreme Event Thresholds Using Data from HMT-2006 and COOP Observers

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Motivation

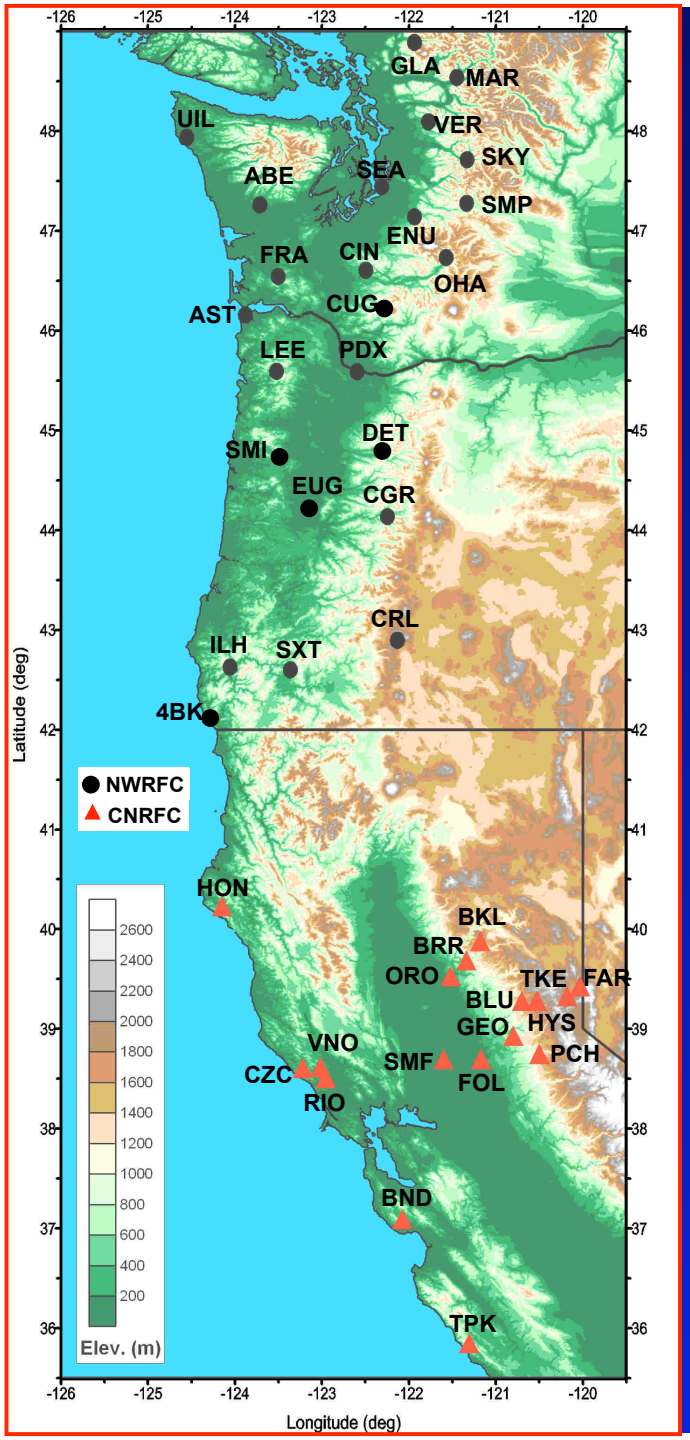
- Many key end-users of QPFs require accurate forecasts (e.g., location, timing, and amount of precipitation) of extreme events (e.g., > 3 in/24 h).
- Current QPF performance evaluation (i.e., > 1 in/24 h threat score) is sub-optimal for extreme precipitation events which tend to occur less frequently and over smaller areas than weaker precipitation events.

Objective

- To develop a QPF evaluation method that is effective for extreme precipitation events and that could be considered for use as a formal performance measure by NOAA.

Context

- The Hydrometeorology Testbed (HMT) has led to the development of the data sets used in this study.



Forecast and Evaluation Data

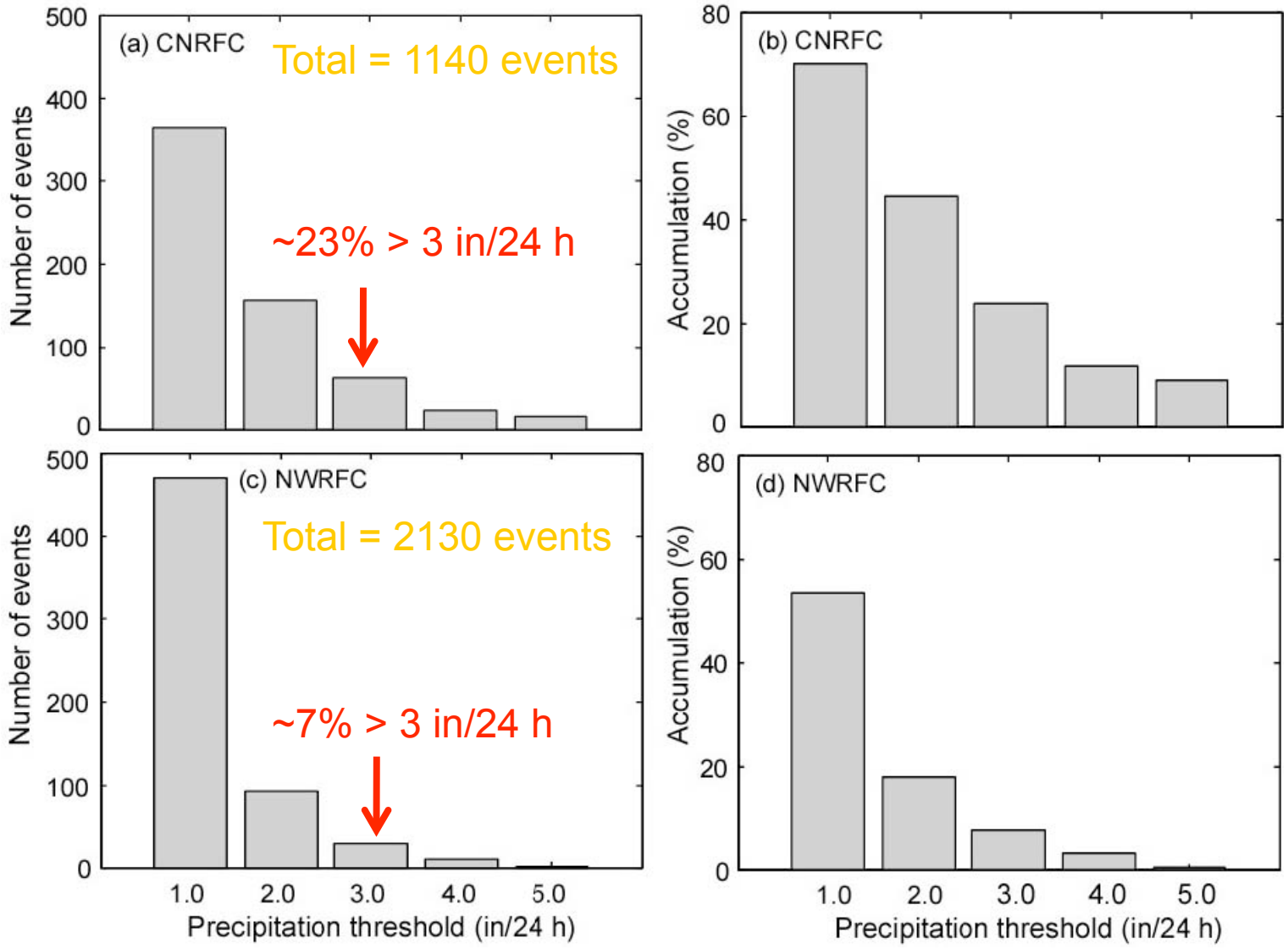
SITES

- Northwest river forecast center (NWRFC)
  - –24 sites in 5 distinct geographic regions: coastal, coastal mts, interior flats, Cascade foothills, and Cascade mts
- California-Nevada river forecast center (CNRFC)
  - –17 sites in 7 distinct geographic regions: coastal, coastal mts, coastal valley, Central Valley, Sierra foothills, Sierra mts, and Sierra lee

DATA

- Winter season: 5 Nov. 2005 to 25 Apr. 2006
- RFC quantitative precipitation forecasts (QPF)
  - –Resolution of 4 km
  - –Forecasts made from 12 Z to 12 Z
  - –Day 1 (24 h), Day 2 (48 h), and Day 3 (72 h)
- RFC quantitative precipitation estimates (QPE)
  - –Resolution of 4 km
  - –12 Z to 12 Z
  - –Gage-based

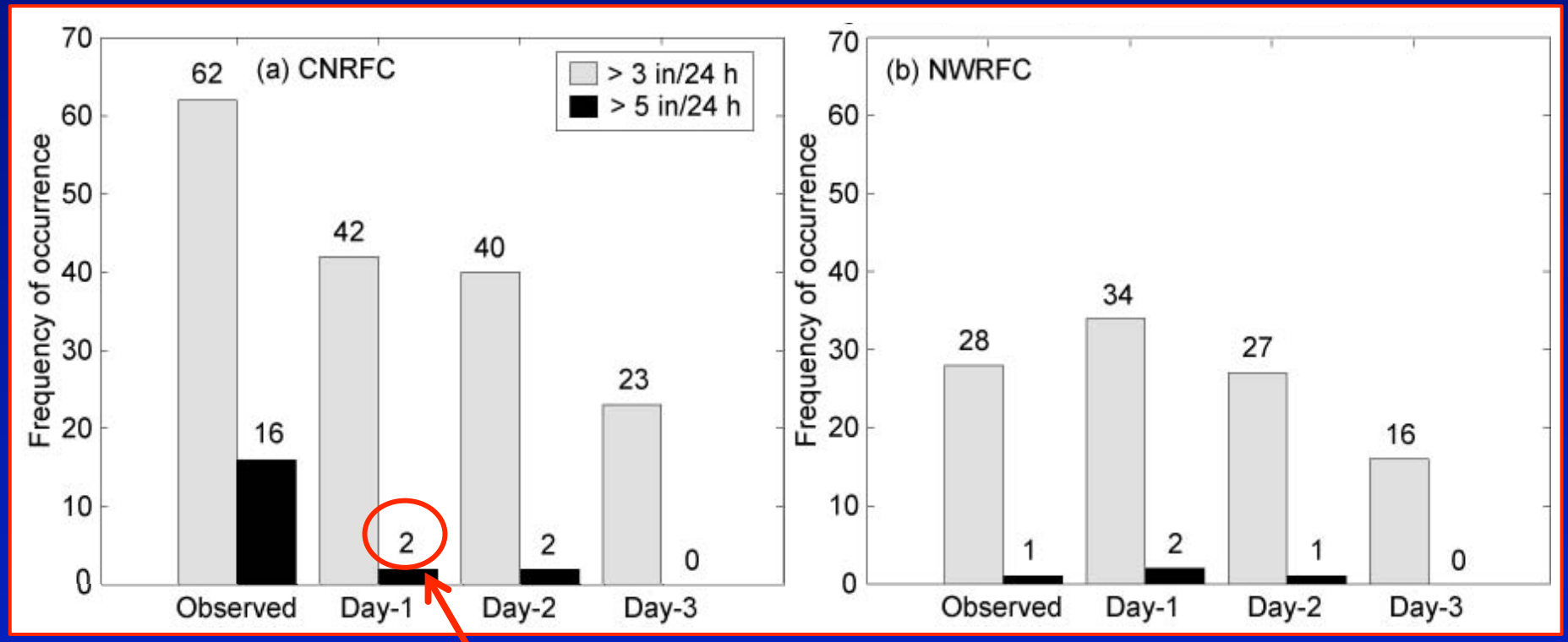
Event Sampling



Extreme QPF Performance Analysis

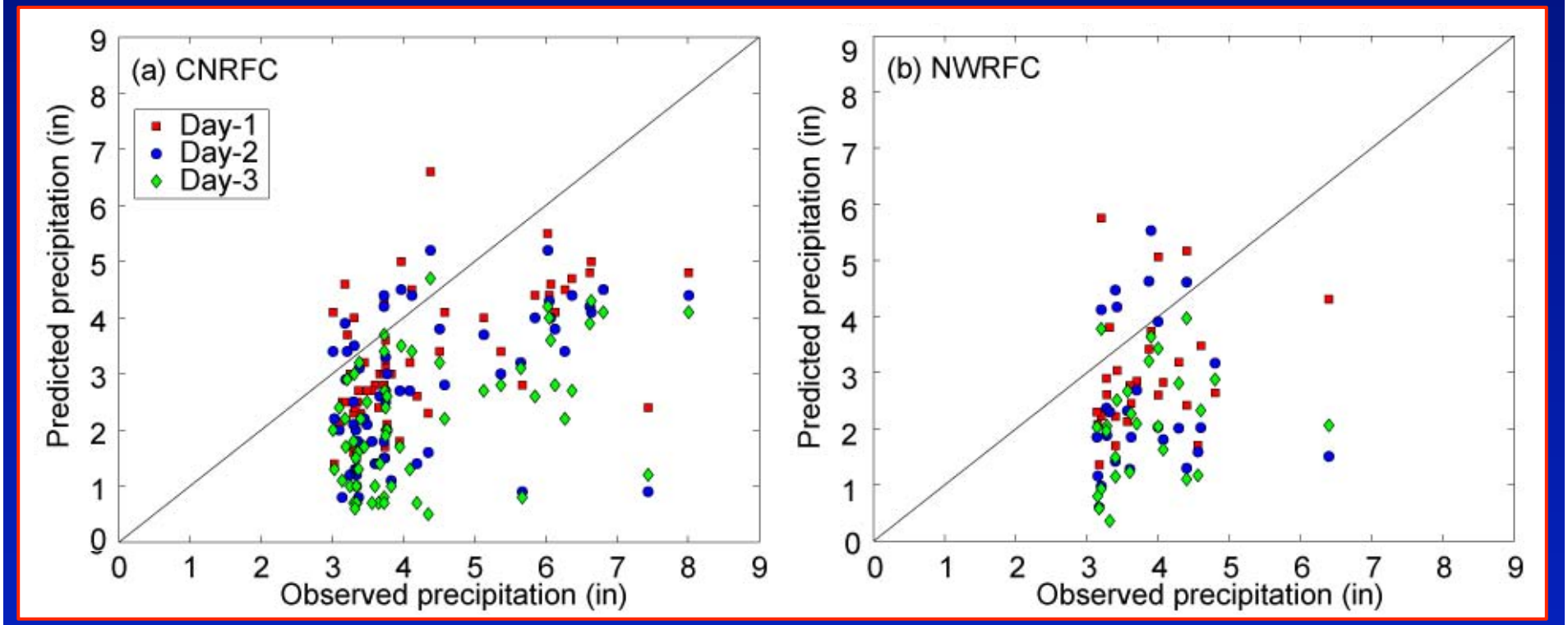
CNRFC underpredicts

NWRFC overpredicts



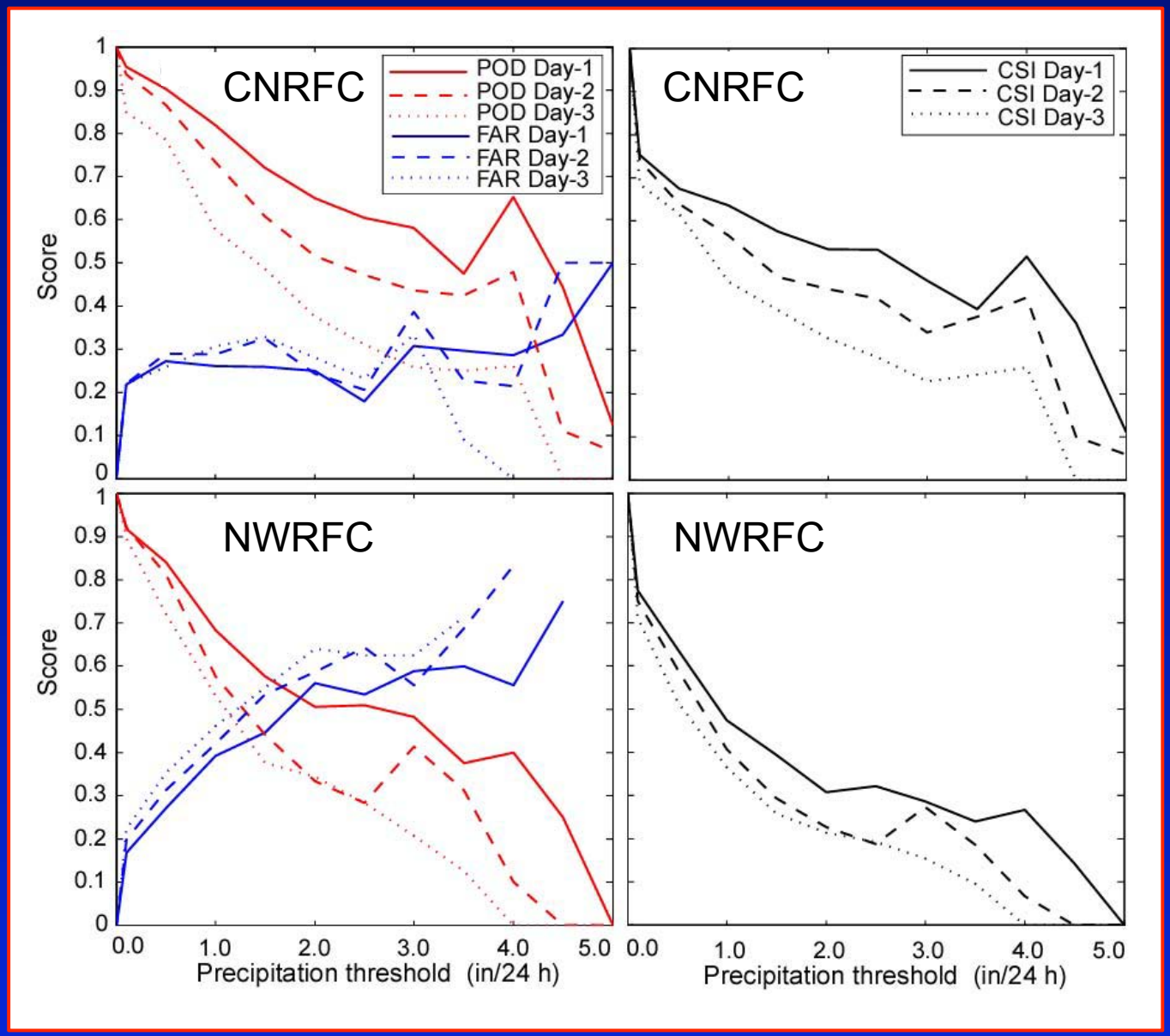
Only 2 events in CNRFC were predicted to be >5”/24 h, one of which was a false alarm

Observed Extreme Events by Lead Time

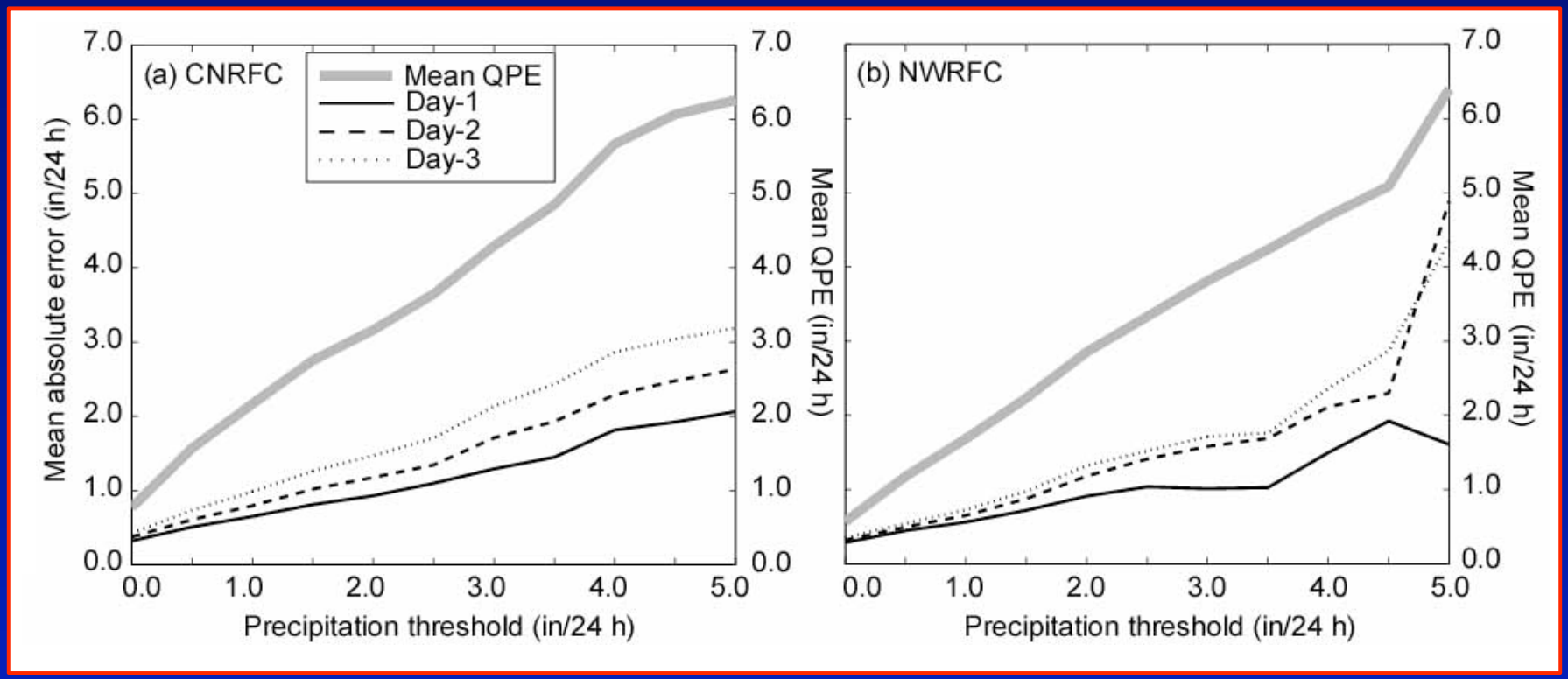


- Both CNRFC & NWRFC under-forecasted extreme events, especially with longer lead time.

POD, FAR, CSI metrics

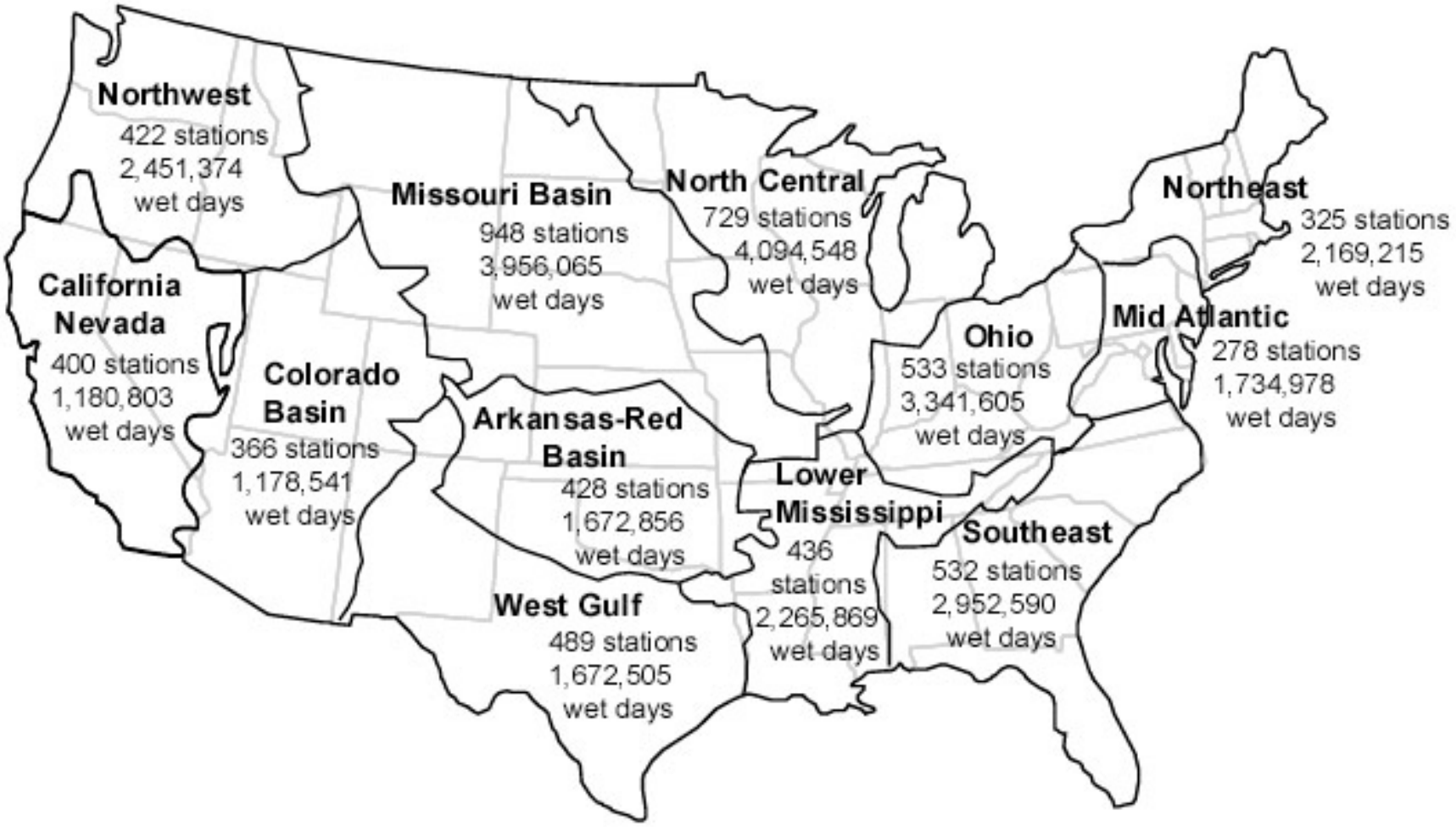


Mean Absolute Error

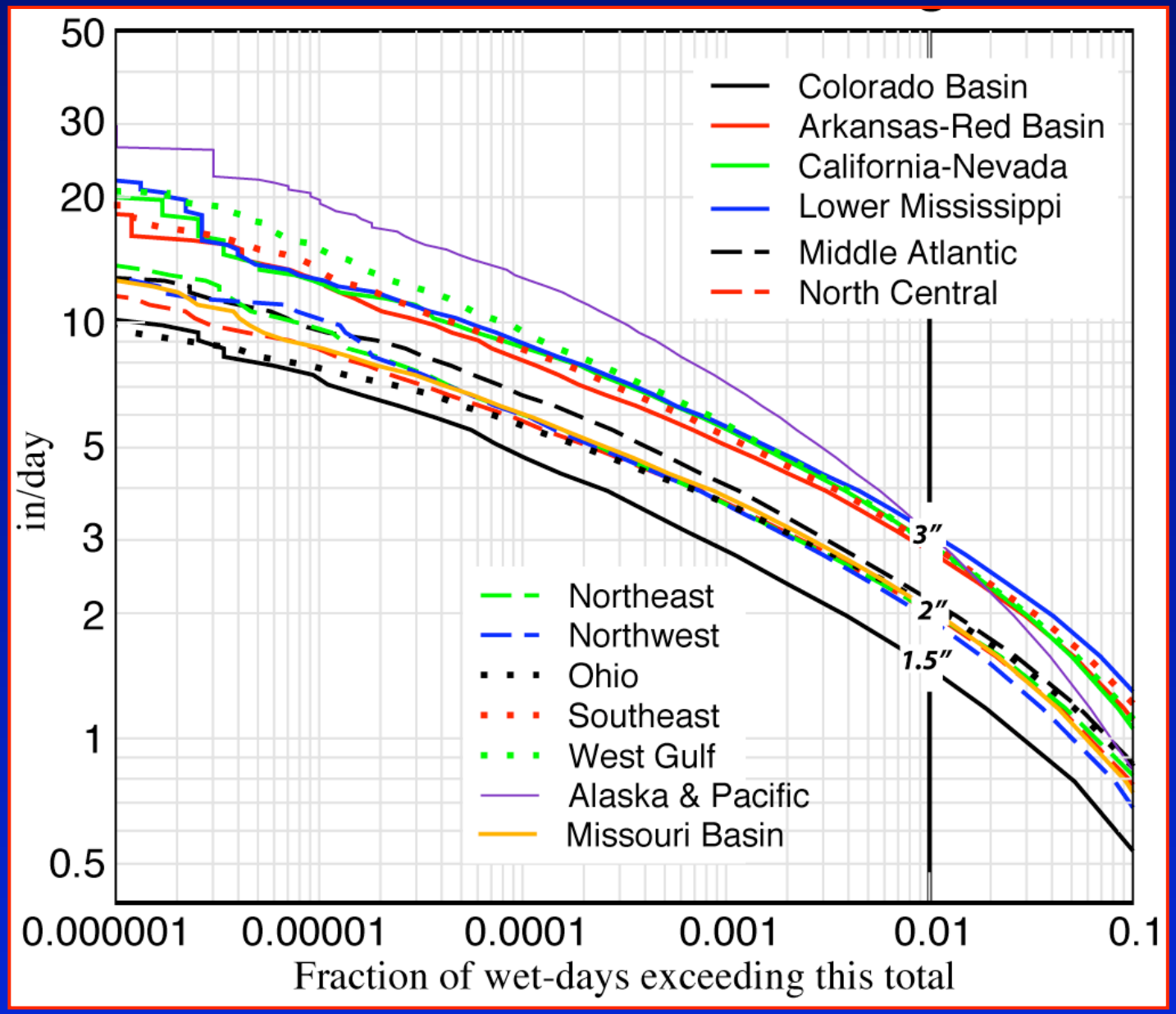


- MAE increases with lead time and threshold for both RFCs.
- MAE is ~ half the average threshold precipitation value

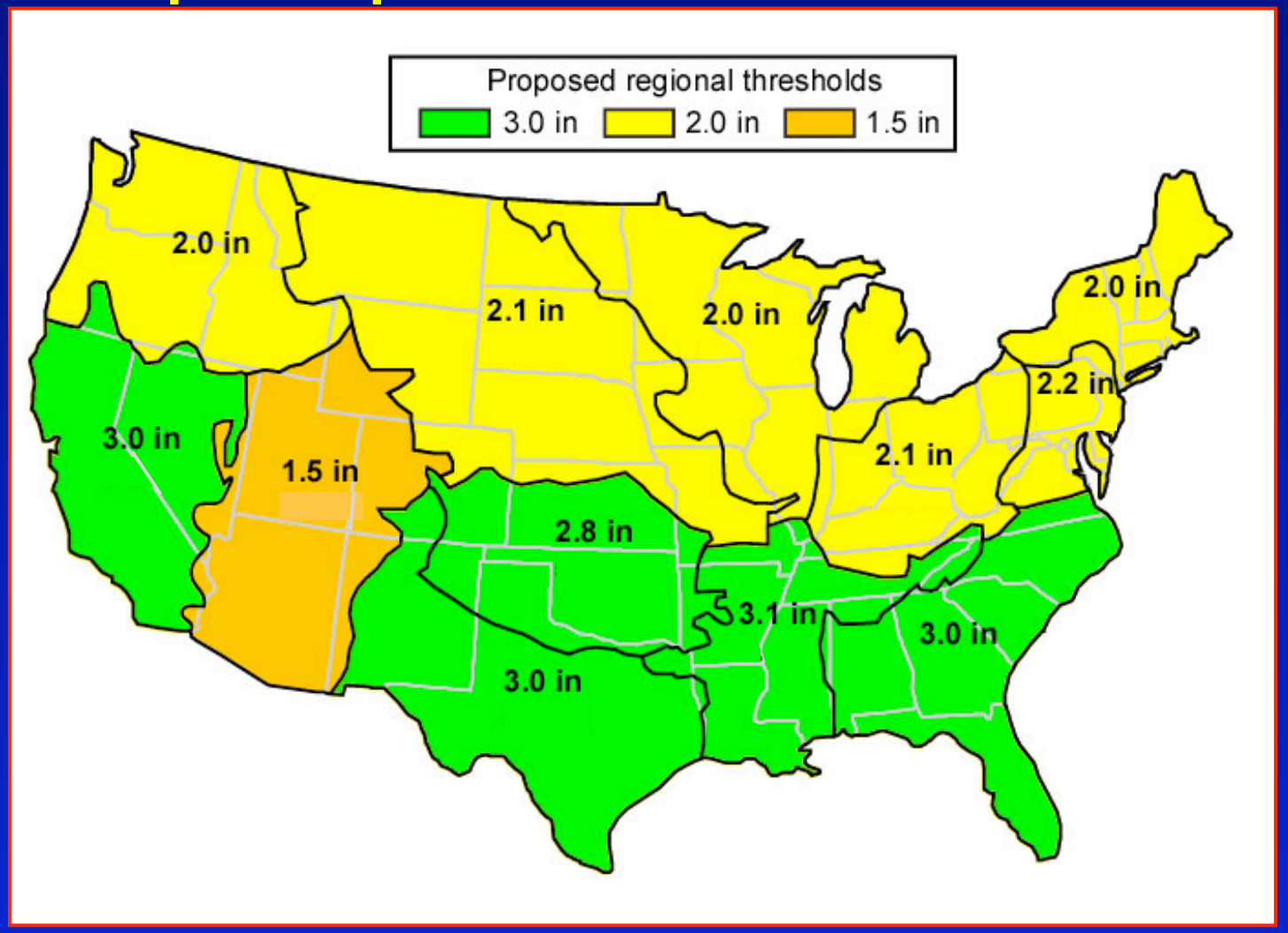
COOP Observer Analysis



Precipitation Exceedence Thresholds



Proposed regional extreme precipitation thresholds



Summary

- QPF evaluation method was developed to assess forecast performance of extreme events.
- Five measures provide most useful metrics of extreme QPF performance (POD , FAR, CSI, bias and MAE)
- Application of QPF verification method to CNRFC & NWRFC regions during HMT 2005/06 for forecast lead times of 24 h, 48 h, and 72 h indicate:
  - Both RFCs generally under-predicted extreme events
  - POD, FAR, CSI, bias, & MAE values are worse with increasing lead time.
- COOP daily precipitation totals were examined to objectively determine regionally relevant thresholds of extreme precipitation events.

Future work

- Evaluation methods & regional thresholds will be applied to all CONUS RFCs retrospectively. This will establish a baseline against which future extreme QPF performance can be assessed.
- In collaboration with NCEP/HPC, these methods & regional thresholds will be applied to NCEP/HPC gridded QPF data.
- These methods & thresholds will be applied to 6-h QPFs to quantify the timing of extreme precipitation within the 24-h accumulation period.